AIR COMPLIANCE INSPECTION REPORT

U.S. Environmental Protection Agency
Region VII
Environmental Sciences and Technology Division

Big Ox Energy
1616 D Avenue
Dakota City, Nebraska 68776

Telephone Number: (920) 615-5246

AFS Plant I.D. Number: 31-043-00092

Inspection Date: February 13-15, 2017

INTRODUCTION

At the request of the Air and Waste Management Division (AWMD), the Environmental Sciences and Technology Division/Environmental Field Compliance Branch (ENST/EFCB) conducted an unannounced Partial Compliance Evaluation (PCE) emissions survey of Big Ox Energy, located in Dakota City, Nebraska. The emissions survey focused on the duct work, pressure relief valves, flare, and Biogas Cleanup Skid System.

Air Program: SIP, NSPS, MACT

Facility Classification Code: No Permit Required-Synthetic Minor

PARTICIPANTS

Big Ox Energy (BOE):
Kevin W. Bradley, Director of Business and Economic Development. (Mr. Bradley participated on the conference call on Day 1 and was onsite on Day 3). kbradley@bigoxenergy.com
Perry Winkler, Plant Manager (Onsite).
Mike Nelson, Maintenance Manager (Onsite).
Jose Argueta, Plant Employee (Onsite).
Rob Ernest, Operations Manager (Conference call).
Bill Guerry, Attorney (Conference call).
Jason Oswald, BOE Engineer (Conference call).

Nebraska Department of Environmental Quality (NDEQ):
Nathan Kush, Environmental Program Specialist (Norfolk Field Office).
Kyle Morton, Environmental Program Specialist (Lincoln Office).

U.S. Environmental Protection Agency (EPA):
Sean P. Bergin, Environmental Scientist

Laura Brewer, Environmental Engineer
Dave Hensley, Physical Scientist

INSPECTION PROCEDURES

I arrived onsite with Messrs. Hensley, Kush, and Morton and Ms. Brewer at approximately 3:00 p.m. on February 13, 2017. We were greeted by the guard and escorted to the security building where we reviewed the visitor safety information and facility rules and signed in. We walked from the security building to the facility where we met with Mr. Winkler. Mr. Hensley explained the purpose of the inspection and we presented our credentials. I then explained my portion of the inspection and was escorted with the NDEQ inspectors to the control room by Mr. Argueta. After reviewing some basic facility operations with Mr. Argueta, Mr. Nelson entered the control room and informed us that the inspection was over for now and that we were to come with him to a conference room that is located in the security building, where we met Ms. Brewer and Mr. Hensley. Once in the conference room we had a conference call with Messrs. Oswald, Bradley, Ernest, and Guerry. The following reasons were given for not allowing entry into the facility for the inspection:

- The appropriate facility people were not on site for the inspection;
- Safety issues with training to have personnel on the roof;
- The right people to provide safety training were not available; and,
- Paperwork to be signed needed to be reviewed.

Mr. Hensley contacted Anne Rauch (EPA Counsel) to explain the situation, and I contacted Jeff Field (ENST/EFCB) and Joe Terriquez (AWMD). I then drove offsite to the service road that runs along the south and east borders of the BOE property to take photographs and FLIR Infrared images of the facility. The NDEQ personnel accompanied me and sampled H_2S concentrations. A flare upset, which was photographed and recorded using the FLIR camera, occurred from approximately 4:24 to 4:27 p.m. Later that evening I was informed by Ms. Brewer that she, Mr. Hensley and myself would have a conference call with Ms. Rauch the morning of February 14, 2017, to discuss site entry.

During the conference call the morning of February 14, 2017, we were informed that we would not be able to gain access to the facility until 9:00 a.m. February 15, 2017. I returned to BOE alone and recorded FLIR images of the BOE duct work from the anaerobic digesters to the flare and the Biogas Cleanup Skid System (BCSS) from the service road. A flare upset, which was photographed and recorded using the FLIR camera, occurred from approximately 10:35 to 10:39 a.m.

At 9:00 a.m. on February 15, 2017, I returned to the facility and met with Ms. Brewer and Mr. Hensley, the NDEQ inspectors, and Messrs. Winkler, Bradley, and Nelson. Following a safety review and tour of the flare and BCSS, Mr. Bradley, the NDEQ inspectors, and I, left the group to record FLIR images. I recorded FLIR images of the duct work from the anaerobic digesters to the flare and BCSS, including all connectors and pressure relief valves (PRV), from some areas of the roof and from ground level. When I concluded recording FLIR images, we met with the rest of the participants in an office in the facility. I reported what I had done and gave preliminary details of what I had observed with the FLIR camera, including the observed flare

upsets. I copied all of the FLIR images recorded to a DVD and provided it to Mr. Bradley before leaving the facility.

PROCESS/FACILITY DESCRIPTION

BOE is a newly constructed, biologically-based, natural gas production facility, located in Dakota City, Nebraska. The BOE biogas facility is capable of producing up to 1,314 million standard cubic feet of biogas per year from an anaerobic digestion process. Feedstock for the process consists of process wastewater and organic wastes from the surrounding industries. A construction permit for the facility was issued on April 15, 2016 (Attachment 1).

BOE receives wastes and packaged food wastes by truck. The waste is unloaded into two receiving pits which flow to the Receiving Tank. [redacted]

Currently, the untreated biogas is flared. Once the BCSS is operational, the biogas from Anaerobic Digesters #1 and #2 will be ducted to the BCSS. This system will compress, scrub, and directly inject the treated biogas into the adjacent natural gas transmission line. The BOE permit application indicated that the BCSS will remove sulfur *"The scrubbing process will result in crystalline sulfur solids that will be washed and sold as a sulfur by-product."*. During the inspection I learned that a sulfur removal system will not be installed. BOE representatives stated that the waste stream contains very little sulfur and that sulfur removal is not necessary.

The compression process of the BCSS creates a compressor tail gas that will be vented directly to the atmosphere. If the BCSS is unavailable or treated biogas cannot be injected into the natural gas transmission line, BOE will send the biogas from Anaerobic Digesters #1 and #2 to the flare. In the construction permit application, BOE requested an operational limitation of 500 annual operating hours for the flaring of biogas.

SURVEY OBSERVATIONS AND FINDINGS

Day 1 (February 13, 2017).

Weather Conditions: clear, with a maximum temperature of 54°F and wind speeds of 10 to 22 mph from the west south-west.

During my brief interview with Mr. Argueta, I was told that the pressure of the anaerobic digesters is monitored. The pressure was 2.3 psi at the time of the inspection. The pressure in the duct from the digesters to the flare is 9 psi. The pressure in the digesters only appears to go up when the flare is not functioning properly, which had not happened for approximately one month. Prior to that period, the flare went out regularly.

FLIR images of the flare, BCSS, and PRVs, were recorded from south and southeast of the facility from approximately 4:00 to 4:30 p.m. (offsite). The FLIR images were recorded from Site's A, B, and C (Please refer to Attachment 2, which contains an annotated aerial of the facility showing the locations of equipment and the areas where images were recorded, along with the FLIR log, Photograph Log and Photographs taken at the time of the inspection).

An upset was observed from approximately 4:24 to 4:27 p.m. This is documented by photographs taken from 4:25 to 4:47 p.m. (See Photographs 1 through 13, Attachment 2). The photographs were taken from sites B and C (or in route from B to C). The upset is also documented on FLIR images MOV_1370.mp4 and MOV_1371.mp4 (Attachment 3, CD).

Mr. Morton and Mr. Kush were sampling H_2S concentrations with a Jerome 631-X Analyzer at the time of the upset. The results of their sampling can be found in Attachment 4.

Day 2 (February 14, 2017).

Weather conditions: Clear, with a maximum temperature of 49°F and winds 15 to 25 mph from the north west.

I arrived onsite alone at approximately 9:00 a.m. and told the guard at the gate that I would be offsite on the service road to record FLIR images and photographs of the facility. I recorded FLIR and regular visual images of the flare, BCSS, PRVs, and the duct to the flare and BCSS (in this report the PRVs are arbitrarily labelled PRV1W through PRV4W). A telephoto lens was used for most of the recorded images, many of the images include high sensitivity mode (HSM) images as well. Images were recorded from Site's A, B, C and D.

An upset was observed from Site A at approximately 10:35 to 10:39 a.m. This is recorded on Photograph 17 (Attachment 2) and on FLIR image MOV_1374.mp4 (Attachment 3). Although the upset occurred from 10:35 to 10:39, FLIR image MOV_1373.mp4, recorded at 10:09 a.m., appears to indicate that the flare was not operating properly as early as 10:09 a.m. that day.

Day 3 (February 15, 2017).

Weather conditions: Clear, with a maximum temperature of 49°F and wind 7 to 15 mph from the south south-east.

The participating EPA and NDEQ inspectors were onsite at 9:00 a.m. and met with Messrs. Winkler, Bradley and Nelson. Mr. Bradley and I discussed roof access. Non-intrinsically safe equipment is not allowed on the roof over the digesters. I agreed to FLIR from the safe areas of the roof only. We then toured the flare and BCSS. I recorded FLIR image, at that time, of the duct leading to the flare, the flare, and the BCSS (Location 1). During the tour we asked about the observed plant upsets that occurred on the 13th and 14th. A facility representative explained that on Monday (2/13/2017) technicians had arrived to begin startup of the BCSS. Up to this point the system had not been used and all gas generated was flared. During a test of the system, the valve leading to the first compressor did not open, which caused pressure to back flow into the biogas header and to the flare. This happened again on 2/14/2017. Big Ox plans to attempt a

startup of the system with a lower volume of gas the next time they test the system. Big Ox had not reported the incidents to NDEQ. Big Ox believes they are still in the "Shake-down period", and view the incidents as part of operational startup. After the tour Mr. Bradley took the NDEQ inspectors and myself to do the FLIR imaging work.

I took FLIR images of the PRVs, gas duct, and flare, some from the roof and some from the ground level. FLIR images of the PRVs and duct connectors contain HSM images. All locations of recorded images are logged.

SUMMARY

Big Ox Energy is operating under a construction permit issued by NDEQ on April 15, 2016.

The duct from the anaerobic digesters to the flare and BCSS, including the PRVs and duct connectors, were observed using a FLIR IR camera over a 3-day period, both on and off-site.

Two process upsets were observed. The first on Monday, February 13, 2017, from 4:24 to 4:27 p.m. and the second on Tuesday, February 14, 2017, from 10:35 to 10:39 a.m.

Some of the recorded images of the flare, such as MOV_1373.mp4, appear to indicate that un-combusted hydrocarbons may be exiting the flare. All of the recorded images are currently under review by the AWMD.

Sean P. Bergin
Environmental Scientist
Date: 2/27/2017

Attachments:

1. BOE Construction Permit, 13 pages.
2. Annotated Aerial, Photograph Log, FLIR Log and Photographs, 22 pages.
3. FLIR Images, CD.
4. NDEQ Field Report, 2 pages.